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RECENT WINTERS IN LONDON.

WE must start with a definition—by winter we desire always to indicate the three months, December, January and February. With our variable climate March is sometimes, as it has been this year, colder than the preceding December, and then of course January to March is colder than December to February. But in making comparisons rigorous uniformity is essential, and that is why we preface our notes with this definition.

In the next place, we must probably justify ourselves for taking the mean temperature at 9 a.m., instead of the mean daily temperature. For this we have several reasons—(*a*) That it is not settled whether the Greenwich corrections to the arithmetical means of the maximum and minimum readings are or are not generally applicable, nor how far they are dependent on the pattern of thermometer stand employed; while, therefore, uncertainty hangs over one method, and another is free from it, we prefer to adopt the simpler: (*b*) The mean temperature at 9 a.m. is not very different from the mean daily temperature, probably within 1°, and presumably its departure from the true mean in every year is nearly alike. Hence, *if* the adoption of the mean 9 a.m. temperature instead of the mean daily temperature involves any error, it is probably a nearly constant one, and in that case will not affect the comparison of successive winters: (*c*) By giving simply arithmetical means without any corrections, we give values which are at any future time identifiable and available for future treatment: and lastly, (*d*) It is a very simple way of comparing temperatures, and our readers can easily make a table of their own observations in the same form and compare their results with ours. One more prefatory remark. The whole of the readings have been made from thermometers absolutely without error, but mounted on a Glaisher pattern thermometer stand.

Mean Temperature at Camden Square, London, at 9 a.m. 1858-1881.

	Mean Temperature.				Diff from Mean of 23 years.			
Year.	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.
1858-9	39·9	39·8	42·1	40·6	+ ·7	+1·8	+2·0	+1·5
1859-60.....	36·5	39·8	35·2	37·2	—2·7	+1·8	—4·9	—1·9
1860-1	35·6	33·0	41·2	36·6	—3·6	—5·0	+1·1	—2·5
1-2	39·6	38·7	41·4	39·9	+ ·4	+ ·7	+1·3	+ ·8
2-3	43·3	42·2	41·0	42·2	+4·1	+4·2	+ ·9	+3·1
3-4	43·2	36·4	36·0	38·5	+4·0	—1·6	—4·1	— ·6
4-5	38·2	35·6	36·6	36·8	—1·0	—2·4	—3·5	—2·3
5-6	42·4	42·7	41·3	42·1	+3·2	+4·7	+1·2	+3·0
6-7	43·3	34·8	45·2	41·1	+4·1	—3·2	+5·1	+2·0
7-8	38·4	37·8	43·9	40·0	— ·8	— ·2	+3·8	+ ·9
8-9	46·1	41·3	45·8	44·4	+6·9	+3·3	+5·7	+5·3
9-70.....	37·8	38·2	36·5	37·5	—1·4	+ ·2	—3·6	—1·6
1870-1	33·9	33·5	42·3	36·6	—5·3	—4·5	+2·2	—2·5
1-2	38·2	40·8	44·3	41·1	—1·0	+2·8	+4·2	+2·0
2-3	42·4	41·8	34·6	39·6	+3·2	+3·8	—5·5	— ·5
3-4	40·6	41·5	38·3	40·1	+1·4	+3·5	—1·8	+1·0
4-5	33·4	43·4	34·8	37·2	—5·8	+5·4	—5·3	—1·9
5-6	38·7	36·7	41·1	38·8	— ·5	—1·3	+1·0	— ·3
6-7	43·9	42·4	43·6	43·3	+4·7	+4·4	+3·5	+4·2
7-8	39·9	39·6	41·6	40·4	+ ·7	+1·6	+1·5	+1·3
8-9	33·3	31·8	37·8	34·3	—5·9	—6·2	—2·3	—4·8
9-80.....	32·1	32·2	40·7	35·0	—7·1	—5·8	+ ·6	—4·1
1880-1	42·8	30·2	37·8	36·9	+3·6	—7·8	—2·3	—2·2
Mean.....	39·2	38·0	40·1	39·1	...	...	...	...
Max	46·1	42·7	45·8	44·4	...	...	...	...
Min	32·1	30·2	34·6	34·3	...	...	...	...
Range ...	14·0	12·5	11·2	10·1	...	...	...	...

As regards the individual months, the years in which the temperatures have been more than 5°, either above or below the average, have been as follows :—

December : 6°·9 *above* in 1868.
„ 5°·3 *below* in 1870, 5°·8 *below* in 1874, 5°·9 *below* in 1878, and 7°·1 *below* in 1879.
January : 5°·4 *above* in 1875.
„ 6°·2 *below* in 1879, 5°·8 *below* in 1880, and 7° 8 *below* in 1881.
February : 5°·1 *above* in 1867, and 5°·7 *above* in 1869.
„ 5°·5 *below* in 1873, and 5°·3 *below* in 1875.

The first striking fact in this analysis is, that of the four *hot* months, all but one occurred before 1870; and of the nine *cold* months, all occurred in or after 1870, and five of them in the last three years.

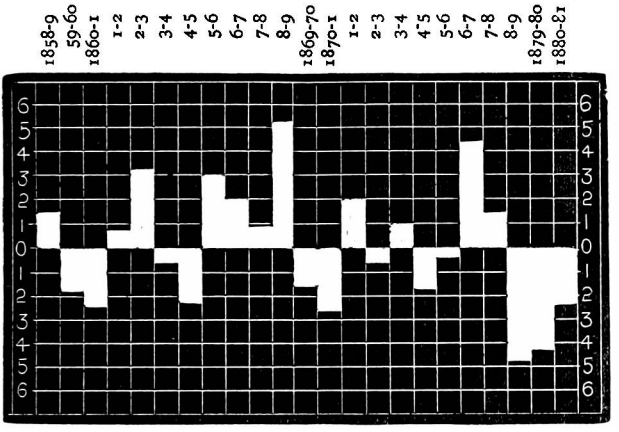
For the whole winter we must not expect so wide a range as for

individual months. We will take instances of winters 4° above or below the average :—

Winters *above* the average : 1868-9, 5°·3, and 1875-6, 4°·2.
„ *below* „ „ 1878-9, 4°·8, and 1879-80, 4°·1.

The foregoing figures will show that, at any rate as regards the past twenty-three years, the last three winters have been extremely severe.

This is further illustrated by the following diagram, which shows the amount by which each of the past twenty-three winters was above or below the average.



THE ORGANIZATION OF THE METEOROLOGICAL SERVICE IN SOME OF THE PRINCIPAL COUNTRIES OF EUROPE.*

(Continued from page 39.)

II.—Belgium.

The following article—like the previous one for France—has been almost entirely compiled, in a condensed form, from the very able report by Dr. Gustav Hellmann to the Prussian Minister of Instruction.

In considering the meteorological service of Belgium, we propose to divide the subject as follows :—(*a*) the observations made at the Royal Observatory, (*b*) the network of meteorological stations, and (*c*) the telegraphic weather service under the Royal Observatory.

(*a*) The "Royal Observatory of Brussels" owes its origin to the strenuous efforts of the late L. A. J. Quetelet, for many years the permanent secretary of the Royal Academy of Sciences. As early as March, 1824, Quetelet laid a paper before the Academy, strongly advocating the establishment of the Observatory, which was finally decided upon on the 8th June, 1826. It was not, however, until

* See *Met. Mag.*, March, 1881.

the beginning of 1832 that the Observatory was ready for work. From the time of its first establishment it has included a meteorological and a magnetical department (in addition to one for astronomy) and has rendered important services to these sciences---especial attention having been given to climatological and phenological observations. After Quetelet's death (7th February, 1874), the service at the Observatory was entirely re-organized, at an expense of about £4,000, and M. J. C. Houzeau was appointed director.

In Vol. xi. (1857, 4to) of the Annals of the Observatory, will be found a detailed description of this establishment, and of the instruments used before the re-organization, and in the Annuaire for 1880 (18mo), particulars are given respecting those now in use. The position of the Observatory, on the N.E. of the city of Brussels is not so favourable as might be; the prevalent S.W. winds, for instance, are not felt until they have traversed the town and have consequently become somewhat heated. This fact partially explains the somewhat high temperatures published by Quetelet, in addition to which the exposure of the thermometers outside a window was objectionable.

The magnetic observations also are somewhat influenced by the iron railings of the garden, and by the proximity of the railroad.

The Observatory is rich in self-recording instruments. One of Kreil's barographs (*Prag Jahrbuch*, 1843), which registers by mechanical means every five minutes, has long been in use. Eye observations of the barometer and thermometer have been published in the *Annals*. The anemometer is of Osler's construction, and is fitted with an apparatus which registers the rainfall continuously. The wind observations have also been published in the *Annals*. The direction and velocity of the upper and lower clouds are also given. Two rain gauges (area 2 sq. dm., *i.e.*, $6\frac{1}{4}$ in. diam.) are placed on the south terrace of the Observatory—one for rain and the other for snow; there is also a third gauge, which receives the falls according to the eight principal directions of wind. This gauge has an aperture of 5 dm. = 19·7 in., which is kept to the wind by means of the wind vane; the gauge communicates with a cylindrical vase within the tower by means of a small tube. Two series of underground temperature observations are made at various depths, and atmospheric electricity is observed daily at noon, by means of a Peltier electrometer. Since the re-organization the Observatory has acquired, *inter alia*, barographs of the Kew (photographic) pattern and M. van Rysselberghe's (electrical) pattern, a Robinson's anemometer, and a barometer and thermometer-testing apparatus. The new earth thermometers are to be read off in a room, by an arrangement proposed by M. van Rysselberghe.

The following is a list of the principal publications, which also include astronomical observations:—

1. *Annales de l'Observatoire.* 25 vols., 1834—77. 4to.
2. *Annales Météorologiques de l'Observatoire.* 13 vols., 4to. 1867—79 (containing the meteorological and magnetical observations of the above series).

3. *Annuaire de l'Observatoire.* Containing among various other matters, meteorological and magnetical articles. 47 vols., 1834—80. 18mo.
4. *Sur le Climat de la Belgique.* 2 vols., 1849—57. 4to.
5. *Sur la Physique du Globe.* 1 vol., 1861. 4to.
6. *Météorologie de la Belgique, comparée à celle du Globe.* 1 vol., 1867. 8vo,
7. *Observations sur les Phénomènes périodiques.* In the Memoirs of the Royal Academy, which also contain various articles, principally by Quetelet. 4to.
8. *Catalogue des Ouvrages d' Astronomie et de Météorologie de la Belgique.* 1878. Large 8vo.

(*b*) It is only recently that the complete network of stations has been established. The Observatory had for many years lent instruments to individual observers, but there was no regular return of registers, nor inspection of stations. Some results, however, have been published by Quetelet in the *Climat de la Belgique* and in the *Mémoires de l' Académie.* On the 1st January, 1879, the observing system consisted of 1 station of the first order (Brussels), 3 International stations (for which the observations are published *in extenso* on the plan recommended by the Vienna Congress), and about 30 climatological stations. Most of the latter are volunteer stations, and are furnished with instruments similar to those at stations of the second order. The positions and other particulars are given in the *Annales Météorologiques.* The observations are taken at 8h. a.m. and 1h. p.m., and are sent monthly to the central station, and the monthly results are published in a special work entitled "*Observations des Stations Climatologiques.*

Since 1870 observations on thunderstorms have been made, the number of stations now being about 100, the observations being similar to those taken in France. A *résumé* is published yearly in the *Annuaire de l' Observatoire.* A special work on this subject by M. Lancaster, entitled "*L' étude des Orages en Belgique,*" has been published.

(*c*) The service for Weather Telegraphy is also of recent date; daily weather reports have been published since 1877. The *bulletin* contains two charts for 8h. a.m. of the *previous day,* also two charts for 8h. a.m. of the day of publication; and also a graphical representation of the curves of the photographic self-recording instruments at Brussels for the previous 24 hours, and a general summary of the weather.

Telegraphic reports are received from 50 inland or foreign stations, and summaries are sent in the afternoon to the seaports, and later in the evening the *bulletin* is distributed to the principal places of the kingdom.

The Observatory is superintended by a council of five members. The yearly income at the disposal of the Service at the time of Dr. Hellmann's report amounted to £3,256, including the astronomical

department—exclusive of the allowance for outfit at the time of the re-organization.

The meteorographs devised by M. van Rysselberghe, which are erected at Brussels and Ostend, are deserving of special mention, being at once simple, accurate, very ingenious and comparatively cheap, by means of which the indications of a number of meteorological instruments of any kind can be registered, whether they be placed near to or far from the registering apparatus. The instrument engraves automatically on metal plates, from which as many copies as desired may be struck off. A single burin put in motion by a simple electro-magnet can engrave successively on one and the same metallic plate the elements of all the curves. It is obvious that much expense and labour are thus saved in the reproduction of the curves themselves, without any intermediate work of reduction or preparation for the engraver or lithographer. The apparatus costs from £160 to £200, and is made by Olland, of Utrecht, and Schubart, of Ghent. A full description of it will be found in the *Quarterly Journal of the Meteorological Society*, Vol. II. In the Brussels instrument the curves for five days are included on one plate, whereby the cost of production is considerably diminished.

III.—Holland.

The "Royal Meteorological Institute of the Netherlands," at Utrecht, the official establishment for Meteorology, was permanently established in 1854; but it had already existed as a private institution since 1849. It is under the immediate control of the Minister of the Interior, and the director is the eminent meteorologist, M. C. H. D. Buys-Ballot, Professor of Mathematics in the University of Utrecht, and whose name is well-known in this country. The chief assistants are Baron van Heerdt and Captain van Hasselt, who are specially charged with the departments of Land and of Ocean Meteorology. We shall consider each of these branches separately.

(A) *Land Meteorology.*—There are two observing stations of the first order, viz., Utrecht and Gröningen; three of the second, five of the third, and thirty of the fourth order. Four of the stations are partially provided with self-recording instruments, and at the other stations of the second and third order eye observations are generally taken at 8h. a.m., 2h. and 8h. p.m. The stations of the fourth order record rainfall and phenological observations. Some of the observers are volunteers and provide their own instruments; others receive their instruments from the Institute or other public establishments. All the instruments are compared at Utrecht, and the stations are regularly inspected. The observations taken at the land stations are published in the *Nederlandch Meteorologisch Jaarboek*, for 31 years (1849-79), including the volumes published before the Institute became a state establishment. There was also a previous publication by Van Rees, entitled, *Uitkomsten van de meteor, waarnemingen gedaan te Utrecht in de Jaaren*, 1839-1843, Utrecht, 1844. The year-

books contain the observations made three times a day at from 7 to 10 stations, as well as rain, phenological, and other observations at from 30 to 40 stations. They also contain the *differences from the means* for barometer and thermometer and meteorological summaries for the respective years. Magnetic instruments of the Kew and Lamont's pattern are placed in an observatory in a garden adjoining the "Sonnenburg" at Utrecht, and similar observations are also made at Helder.

The service for Weather Telegraphy is much simplified in Holland, owing to the small extent of territory. Telegrams are received daily from 4 Dutch and 23 foreign stations, and weather reports are issued twice daily—at 8h. a.m. and 6h. p.m.—to 14 seaports. These reports are exhibited for public inspection, and further made known, by means of an apparatus called the "Aeroclinoscope" provided with arms, and designed to indicate the direction and extent of the greatest difference of pressure existing at the Dutch stations. A somewhat similar apparatus was tried experimentally in this country, but was soon discontinued. A daily bulletin is not published, but the weather reports are communicated to the newspapers.

We should mention that Holland was one of the first countries which used the telegraph for the dissemination of weather information. From June, 1860, *barometrical differences* from the mean were telegraphed to the seaports, and made public by means of blackboards. Admiral FitzRoy's storm signals were also adopted for some years, but in 1867 the Aeroclinoscope (above mentioned) was erected at eight of the Dutch seaports by means of which, and by the use of a ball by day and a lamp by night, notice of unfavourable weather was given to the seafaring community — fuller particulars being given on the blackboards. We are also indebted to Professor Buys Ballot for having persistently urged since 1857 the relation between wind and pressure, and the fact that all winds obey the law of storms. This relation was of course previously known to the writers on the cyclone theory, and in a paper by Captain Parish, R.N., communicated to the Royal Geographical Society on 25th February, 1856 (Procs. vol. i. p. 36), we find a distinct reference to the universal application of the principle to all winds in the sentence. "His conclu-"sions are—That all winds, excepting where influenced by the "proximity of much land, are parts of cyclones; obeying in their re-"spective hemispheres the laws which have now been proved to govern "hurricanes, both with regard to their tracks and rotary motion"; but, as pointed out by Mr. R. Strachan, in his instructive lecture on "The Barometer and its uses" (*Modern Meteorology*, Lond., 1879, 8vo.), although the principle was acted on by Admiral FitzRoy in forecasting, he failed to make his views generally intelligible to the public. Hence the credit of popularly enunciating the principle is due to Prof. Buys Ballot, and it is now generally known as "Buys Ballot's Law."

M. Buys Ballot has for many years endeavoured to bring about a meteorological publication of an international character. In the *second*

part of the year-book, which has been published from the year 1865, observations have been given referring to the weather of the whole of Europe, and including some important stations in other parts of the globe *e.g.*, Paramaribo, Nagasaki, Buenos Ayres, &c., for which the observations have been published *in extenso*. The second part of the year-book also contains the deviations of daily temperature and pressure for the principal stations of Europe, as well as a summary of the rainfall and winds for various parts of the globe. Some of the recent volumes (1870-72) also contain long series of barometer and thermometer observations made in Europe, with means for months and for decades from observations made three times a day. A joint publication by Belgium and Holland is also issued, containing observations made at some stations in each country, according to the plan recommended by the International Meteorological Committee.

(B) *Ocean Meteorology.*—Holland was one of the first countries which adopted the plans proposed by the Brussels Maritime Conference of 1853, and sent its observations to Commodore (then Lieut.) Maury at Washington for discussion. Owing to the exertions of Prof. Buys Ballot, however, a special department for ocean meteorology was established, which of course receives the numerous observations made on the Dutch men-of-war and merchant ships. Those captains who were willing to make regular observations received a supply of instruments and registers from the Institute. Two kinds of log-books are issued, which do not differ very materially from those in use in this country. When the logs are returned to the Institute, they are classified according to their character into four grades. The observers receive copies of the marine publications of the Institute. Medals are also given to the observers by the Societies interested in the promotion of ocean meteorology. A silver medal is awarded for two "excellent" logs, and a gold medal for six. The practice of awarding medals as a slight acknowledgment for valuable records was, we believe, first instituted in France, by the *Association Scientifique*, at the instigation of Le Verrier. The method of dealing with the extraction and discussion of the data may be mentioned, being somewhat peculiar. Each register is copied on forms having headings corresponding with the books supplied, and ruled on one side only. Each extract receives a number referring to the register from which it is taken, in order to facilitate any future reference if necessary. The forms are then cut into strips, so that each contains only those observations which belong to the same degree of latitude. They are then sorted according to month and place, ready for entry on charts when required, or are arranged beneath each other for the deduction of mean values.

By far the greatest part of the materials are for voyages made between Holland and India and China. The earlier publications have become out of date by the publication of more recent works. These latter publications differ essentially from the publications in this country, by referring to one element only, *e.g.*, wind, barometer, sea

temperature, &c., each being treated separately. Our space will not allow us to give a complete list of the valuable publications by the Marine department of the Institute. The following summary of some of the the principal works will suffice to show the activity of the Institute in this branch :—"Investigations on Sea Temperature and Currents, 1853, 1861, 1867, 1872"; "Trade-wind Chart, 1856"; Wind Charts of the North Atlantic, 1856"; "General Wind Chart, 1860"; "Storm, Rain, &c., Chart, 1862"; "Atlas and 4 Charts of the Chinese Sea, 1863"; Monthly Wind Charts of the North Atlantic, 1st series, December to May, 1877; 2nd series, June to November, 1878"—a very valuable investigation; "Sailing Directions to and from Java, 1860, 1868—70"; "Routes for Steamers between Aden and the Straits of Sunda, 1871"; "Mean Barometer around the Cape of Good Hope, 1874"; "Routes in China Seas and the Western part of the N. Pacific, 1876." The department has been recently engaged in the investigation of the Meteorology of the China Seas (0°—30° N. lat., 100°—150° E. long.), and the study of the typhoons of that district. It has also entered into an exchange of observations with the German Meteorological Office, supplying the data for the North Atlantic N. of 20° in exchange for the data required for the above investigation undertaken by themselves.

The funds at the disposal of the Institute amount to about £1,700 a year, but this is exclusive of the salaries of the Director and Marine Superintendent, who are paid from other sources. If these salaries are included the annual amount would be about £2,100.

J. S. HARDING.

THE WINTER OF 1880–81.

To the Editor of the Meteorological Magazine.

SIR,—In my letter which you published in November last (see *Met. Mag.*, Vol. xv. p. 160), I stated that "the coming winter should be somewhat colder than (39°·2) the average of the last 40 years." In the following month I stated (see *Met. Mag.*, Vol. xv. p. 166) that "when snow has been observed near London as early as October we have had a colder winter than the average ten times in eleven," and the accompanying table showed that, seven times in eleven, the winter was more than 1° below the average of the last 40 years.

Then, in the following rule (on p. 167) I said, "The years 1869, 1870, 1878, 1879, and 1880 furnish the only instances, since 1865, of the normal condition of things being so reversed, that August was wetter in England than in Scotland, and in each case, up to the present time, the following winter has been cold." We have now to add the winter of 1880–81 to the list of *fulfilled* instances. At the conclusion of my letter I said, "On the whole, we may reckon on the winter of 1880–81 being somewhat colder than the average, but still not much below the mean."

The mean of the winter (December to February, inclusive) two

years ago, was 4°·6 below the Greenwich average of 40 years. The next winter (1879–80) was 3°·4 below the average, and the mean of the winter just past 1°·7 below the average, but not more than 0°·6 below the Greenwich long (110 year) average. So the winter forecast has been fulfilled exactly. We have have had a cold season, "but still it has not been much below the mean."—Yours truly,

GEORGE D. BRUMHAM.

Barnsbury, 5th March, 1881.

SNOW STORM GALES.

IN transferring to our pages the following portion of an article which appeared in the *Inverness Courier* of March 17th, we express no opinion upon the views of the writer, but we know that he is not alone in holding them, and we think that it would be useful if some of our correspondents were to turn their attention to them. We may add, that we believe that the writer resides at Ballachulish, which is in a valley running eastwards from Loch Linnhe, in the north of Argyleshire; but it will be noted that he states that his impressions as to snow storm gales are confirmed by the experience of maritime men, when remote from the disturbing influence of mountains :—

NETHER-LOCHABER.

Of a truth this present month of March came in, in aphoristic phrase, "like a lion," roaring, rampant, raging! with a gale from the east-nor'-east that lashed Loch-Leven and the Linnhe-Loch into angry waves, and sent the spray and spindrift in snow-like showers far over the mountains of Morvern and Mull. In all our thirty years' residence in Nether-Lochaber, we do not remember so violent and lasting a storm from the east; for so fiercely and continuously did it rage that for three consecutive days and nights even Ballachulish Ferry, less than a hundred yards in breadth, was uncrossable, well adapted to their purpose as are the boats in use, and thoroughly skilled in all the moods and tendencies of winds and tides in their every conceivable combination as are the ferrymen. It may be believed that a sharp eye was kept on the slightest lull in the storm, that instant advantage might be taken of it, in order that our postal communication at all events should not be interrupted; and yet for three whole days we had no papers or letters, except such as reached us *via* Fort-William and Kingussie. All the while it was snowing heavily on the Grampians, with a swirl and drift in such a wind that must have caused vast accumulations in many a narrow pass, and corrie, and gorge, and many an upland glen. Along the seaboard but little snow fell: it was, to use an expressive Gaelic phrase, no more than a *spìonadh sneachd a slugan an t'soirbheis*, a phrase untranslateable with any literalness of rendering, but which means that the snowflakes came reluctantly, and as if with difficulty and against their will, from out the œsophagus of the howling storm; a phase of snow-storms frequently seen along the western seaboard when the gale is easterly, and on the eastern seaboard when the gale is westerly. The gale, in such a case, is always oscillating and unsteady in direction, and the cold intense. It was so on this occasion, and it will always be found to be so when the swirling snowflakes are few and far between, and small, and crisp, and dry, and seem to come reluctantly from out "the throat and gullet" of the storm. What may be called the *anemoscopy* of snow-storms—the constant tendency, that is, of the accompanying winds to frequent shiftings, and lawless eddyings and gyrations—has not yet received the attention which we think it deserves; and we recommend it as a subject in

the study and elucidation of which some of our good friends of the Meteorological Society, with more idle time on their hands than ourselves, might very usefully employ themselves. The puzzle to be solved may be briefly stated thus: How comes it; why is it that no snow-storm gale ever blows for an hour together otherwise than fitfully, unsteadily, and eddyingly? Why should it gyrate and swirl and twirl unceasingly, while other storms frequently blow steadily from compass point to compass point for hours together? We can remember referring to this matter in a communication to the late Admiral FitzRoy; and we have been searching among our meteorological papers for his reply, but cannot for the moment find it. A living meteorologist of eminence to whom we propounded the anemoscopical swirling snow-storm gale as above, endeavoured at a ready solution by suggesting that *all* gales blew in the same gyratory and eddying way, only that the gyrations and eddyings of snow-storms are more palpable, more tangible, so to speak, and more readily discernible, just because of the accompanying snow-flakes, which make the swirlings and fitful shiftings of the gale for the time visible to the eye. This way of putting it, however, is unsatisfactory, when we remember that a *rain*-storm is just as visible to the eye as is a snow-storm; and yet a rain-storm usually blows across the compass card from point to point, with some shiftings and oscillations it may be, but steadily enough upon the whole for hours together; while to the observant dweller by the sea all gales are sufficiently visible to the eye as they sweep across the deep, to convince him that they usually blow with very little of the swirling and eddyings so characteristic of snow-storm gales. If you question a seaman on the subject, whether mere coaster or circumnavigator, he will tell you that in a snow-storm, because of its constant eddyings and gyrations, frequent trimming of sails is more necessary than in any other gale, and that to steer a straight and steady course under such circumstances is for the time simply impossible. Admiral FitzRoy, in his letter to us on the subject, says something about an anemometer specially designed for snow storm gales, which he intended getting made for use at certain selected stations, in order to have the matter thoroughly investigated. He died soon afterwards, however, and the question is still waiting patient, intelligent investigation, and satisfactory solution when "the man and the hour" shall have come.

THE METEOROLOGICAL SOCIETY.

THE usual Monthly Meeting of this Society was held on Wednesday, the 16th ultimo, at the Institution of Civil Engineers, Mr. G. J. Symons, F.R.S., president, in the chair. The Revs. A. J. C. Allen, and E. W. Ford, and Messrs. E. Chapman, G. T. Gwilliam, H. B. Jupp, A. Ramsay, and J. Stokes were elected Fellows. The President gave a historical sketch of various classes of hygrometers, and described about 120 different patterns, after which the Fellows and visitors proceeded to inspect the following instruments:—

Objects.	Exhibitor.
Leslie's Hygrometer	*Mr. P. Adie.*
Dines' Hygrometer, original pattern, for use with iced water	*Mr. L. P. Casella, F.M.S.*
Regnault's Hygrometer (original pattern) ...	,,
Scale and Instructions of Hygrometer, by Prof. G. M. C. Barnabita	,,
Daniell's Hygrometer, unusual shape	*Mr. G. Dines, F.M.S.*
Dines's Hygrometer, first attempt	,,
,, ,, first made	,,
,, ,, to test glass against metal for deposit of the dew...	,,

Objects.	Exhibitor.
Dines's Hygrometer, for use with water or ether, metallic face, the centre separate from the outer part of the metal	*Mr. G. Dines, F.M.S.*
Meteorological Journal, from 1824–27, with observations of the dry and wet bulb thermometers	,,
Damp Detector	*Mr. J. J. Hicks, F.M.S.*
Dry and Wet Bulb Thermometers (Marriott's arrangement)	,,
Bogen's Hygrometer	*Mr. W. Marriott, F.M.S.*
Weather House Hygrometer	,,
Improved form of Rain Gauge receiving bottle..	*Mr. E. Mawley, F.M.S.*
Jones's Hygrometer	*Messrs. Negretti & Zambra.*
Leslie's Hygrometer	,,
Turnover Dry and Wet Bulb Thermometers ...	,,
Mason's Hygrometer with Table for calculating Dew Point	*Mr. F. Pastorelli, F.M.S.*
Dry and Wet Bulb Thermometers with glass scales, for travellers	,,
Dry and Wet Bulb Thermometers with glass scales, mounted on brass pedestal ...	,,
Sick Room and Hospital Meteorological Case ...	*Dr. B. W. Richardson, F.R.S.*
Alluard's Hygrometer	*Mr. R. H. Scott, F.R.S.*
Klinkerfues' Patent Hair Hygrometer	,,
Lowe's Graphic Hygrometer	,,
Regnault's Hygrometer (second pattern) ...	,,
Saussure's Hair Hygrometer	,,
Catgut Hygrometer	*Mr. G. J. Symons, F.R S.*
Daniell's Hygrometer (original pattern) ...	,,
De Luc's Whalebone Hygrometer	,,
Dines's Hygrometer, new pattern, for use with water or ether	,,
Mason's Hygrometer	,,
Photographs of Yorkshire Waterfalls, January, 1881	,,
Saussure's Hair Hygrometer	,,
Radiogram obtained by Winstanley's Radiograph	*Mr. G. M. Whipple, F.M.S.*
Welsh's Slide Rule for Hygrometric Calculations	,,
Table to facilitate finding the Humidity of the Air, by H. C. Russell	,,
Whipple's Cloud Camera	,,
Admiral Jerningham's Hygrometer	*Mr. R. H. C. Wilson.*
Moisture Meter	,,
Swan Quill Hygrometer	,,

SUPPLEMENTARY TABLE OF RAINFALL IN MARCH, 1881.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	2·38	XI.	Carno, Tybritle	5·87
,,	Margate, Acol	1·54	,,	Corwen, Rhug	2·20
,,	Littlehampton	2·53	,,	Port Madoc	3·28
,,	St. Leonards	3·22	,,	Douglas...	4·35
,,	Hailsham	2·87	XII.	Carsphairn	...
,,	I. of W., St. Lawrence.	2·54	,,	Melrose, Abbey Gate...	3·18
,,	Alton, Ashdell.....	2·41	XIV.	Glasgow, Queen's Park.	2·44
III.	Great Missenden.....	2·94	XV.	Islay, Gruinart School..	4·83
,,	Winslow, Addington ...	1·74	XVI.	Cupar, Kembach.....	2·79
,,	Oxford, Magdalen Col...	1·38	,,	Aberfeldy H.R.S.	2·00
,,	Northampton	1·51	,,	Dalnaspidal	3·02
,,	Cambridge, Merton Vil.	1·13	XVII.	Tomintoul.....	2·13
IV.	Harlow, Sheering	1·93	,,	Keith H.R.S.	1·80
,,	Diss	1·85	XVIII.	Forres H.R.S.	1·92
,,	Swaffham	2·04	,,	Strome Ferry H.R.S....	5·01
,,	Hindringham	1·69	,,	Lochbroom	6·63
V.	Salisbury, Alderbury...	2·52	,,	Tain, Springfield.....	2·12
,,	Calne, Compton Bassett	2·14	,,	Loch Shiel, Glenfinnan.	11·43
,,	Beaminster Vicarage ...	2·91	XIX.	Lairg H.R.S.	3·54
,,	Ashburton, Holne Vic..	9·50	,,	Altnabreac H.R.S.	...
,,	Langtree Wick	3·67	,,	Watten H.R.S.	2·34
,,	Lynmouth, Glenthorne.	3·33	XX.	Fermoy, Glenville	6·68
,,	St. Austell, Cosgarne...	5·38	,,	Tralee, Castlemorris ...	3·51
,,	Taunton	...	,,	Cahir, Tubrid	4·80
VI.	Bristol, Ashleydown ...	...	,,	Tipperary, Henry St....	4·80
,,	Ross	1·87	,,	Newcastle West	2·56
,,	Wem, Sansaw Hall.....	1·81	,,	Kilrush	1·82
,,	Cheadle, The Heath Ho.	3·31	,,	Corofin	3·21
,,	Bickenhill Vicarage ..	...	XXI.	Kilkenny, Butler House	...
VII.	Melton, Coston	1·49	,,	Carlow, Browne's Hill..	2·80
,,	Horncastle, Bucknall ...	1·54	,,	Kilsallaghan.....	...
VIII.	Macclesfield Park	3·97	,,	Navan, Balrath	2.01
,,	Walton-on-the-Hill.....	3·03	,,	Athlone, Twyford	2·20
,,	Broughton-in-Furness ..	7·54	,,	Mullingar, Belvedere ...	2·30
IX.	Wakefield, Stanley Vic.	2·77	XXII.	Ballinasloe	..
,,	Ripon, Mickley	3·98	,,	Clifden, Kylemore	7·30
,,	Scarborough.....	2·94	,,	Crossmolina, Enniscoe..	4·63
,,	Mickleton.....	5·28	,,	Carrick-on-Shannon ...	3·22
X.	Haltwhistle, Unthank..	3·49	XXIII.	Dowra	3·78
,,	Shap, Copy Hill	5·36	,,	Rockcorry.....	2·88
XI.	Llanfrechfa Grange	4·28	,,	Warrenpoint	5·73
,,	Llandovery	3·55	,,	Newtownards	3·79
,,	Solva	2·23	,,	Carnlough.....	6·50
,,	Castle Malgwyn	3·99	,,	Bushmills	4·43
,,	Rhayader, Nantgwillt..	6·71	,,	Buncrana	3·48

MARCH, 1881.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Square	2.30	+ ·69	·59	4	11	60·3	18	23·7	1	8	15
II.		Maidstone (Hunton Court)	1·54	— ·04	·46	5	11	...	...	...	...	...	...
,,		Strathfield Turgiss	1·49	+ ·09	·44	5	12	61·7	16	22·2	27	12	17
III.		Hitchin	1·39	— ·09	·43	5	11	56·0	10	22·0	26‖	16	...
,,		Banbury	1·54	— ·06	·45	5	14	58·3	11	21·5	30	15	...
IV.		Bury St. Edmunds (Culford)	1·48	— ·08	·46	5	11	59·0	7, 20	19·0	26‖	16	...
,,		Norwich (Cossey)	1·38	— ·30	·51	5	13	61·0	10	22·0	28**	15	16
V.		Bridport	2·61	...	·62	5	10	60·0	10	21·0	1	12	...
,,		Barnstaple	2·93	+ ·44	·41	4	16	58·0	7	23·0	1	...	...
,,		Bodmin	5·80	+ 2·64	1·60	3	17	58·0	23	23·0	1	7	13
VI.		Cirencester	2·32	+ ·25	·47	6	9	...	...	...	...	...	...
,,		Church Stretton (Wcolstaston	2·46	+ ·30	·69	5	16	59·5	17	23·0	30	13	...
,,		Tenbury (Orleton)	2·06	+ ·19	·57	5	14	62·8	17	20·5	28	15	19
VII.		Leicester (Town Museum)	1·43	...	·45	5	13	59·7	11	22·8	1	12	21
,,		Boston	1·73	+ ·44	·61	5	9	60·0	11	23·0	1	14	...
,,		Grimsby (Killingholme)	2·24	+ ·58	·65	5	14	56·5	7	22·0	2	9	...
,,		Mansfield	3·07	+ 1·25	·89	5	11	58·6	11	16·8	1	14	19
VIII.		Manchester (Ardwick)	4·31	+ 1·86	·91	9	18	59·0	10††	23·0	1	11	...
IX.		Wetherby (Ribstone)	3·16	+ 1·03	1·56	6	7	...	...	...	..	...	...
,,		Skipton (Arncliffe)	7·37	+ 2·61	1·85	9	20	57·0	12	15·0	1	12	...
X.		North Shields	2·92	+ 1·47	·91	5	17	55·0	17	16·2	2	16	17
,,		Borrowdale (Seathwaite)	15·52	+ 5·63	3·30	9	22	...	...	...	...	..	...
XI.	WALES.	Cardiff (Ely)	4·13	+ 1·44	·67	4	11	...	...	...	...	..	...
,,		Haverfordwest	3·70	+ ·51	·70	13	14	54·5	6, 7	24·2	28	11	12
,,		Aberystwith Goginan	...	...	...	...	...	...	...	...	...	...	...
,,		Llandudno	2·13	+ ·25	·42	8	17	56·0	17	28·0	31	10	...
XII.		Cargen	5·57	+ 2·79	·96	23	18	56·0	15	19·0	22	13	...
,,		Hawick (Silverbut Hall)	1·96	·00	·50	6	15	...	...	..	...	...	...
XIV.		Douglas Castle (Newmains)	5·11	+ 1·97	1·44	9	15	...	...	...	...	...	...
XV.		Loch Long (Arddaroch)	...	...	...	...	...	...	...	...	...	...	...
,,		Kilmory	6·51	+ 1·90	1·00	23	21	...	...	15·0	2	15	...
,,		Mull (Quinish)	3·44	...	·64	18	18	..	...	...	..	...	...
XVI.		Loch Leven	5·10	+ 2·98	2·40	6	9	...	...	...	...	...	...
,,		Arbroath	2·63	+ 1·00	·87	13	10	56·0	11*	21·0	2,3¶	15	...
XVII.	SCOTLAND.	Braemar	1·68	— ·51	·30	3	17	51·3	18	3·8	3	21	27
,,		Aberdeen	2·72	...	·96	5	21	59·0	17†	18·0	2§	18	...
XVIII		Portree	6·03	+ ·17	1·16	18	21	...	...	...	...	...	...
,,		Inverness (Culloden)	1·25	— ·50	...	...	..	49·0	13	18·0	22	14	24
XIX.		Dunrobin	2·26	...	·33	10	17	57·0	18	21·0	22	16	...
,,		Sandwick	3·43	+ ·79	·46	27	23	52·1	16	12·7	3	15	19
XX.		Cork (Blackrock)	5·67	+ 2·91	1·66	2	16	62·0	10‡	24·0	28	12	...
,,		Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
,,	IRELAND.	Waterford (Brook Lodge)	3·40	...	·66	3	13	59·0	...	23·0	..	...	...
,,		Killaloe	3·18	...	·50	8	17	61·0	15	23·0	30	13	...
XXI.		Portarlington	2·09	— ·07	·45	6	19	55·0	17	26·0	29	8	...
,,		Monkstown	2·55	...	·53	3	14	62·0	10	23·0	28	..	...
XXII		Galway	...	...	...	...	...	56·0	14	25·0	30	7	...
XXIII		Waringstown	2·80	...	·50	5	17	60·0	11	20·0	29	15	16
,,		Londonderry	3·39	...	·49	8	20	55·0	16	28·0	31	7	17
,,		Edenfel (Omagh)	2·53	+ ·44	·42	13	20	55·0	17	21·0	21**	16	...

* And 17. † And 18 ‡ And 15. § And 21. ‖ And 28. ¶ And 22. ** And 29. †† And 15.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Latter part of the month cold, with sharp frosts at night. Wild heartsease in flower on 1st; honey bee seen on 2nd; first wild violet gathered on 7th; brimstone butterfly flying on 11th.

HITCHEN.—Cold in the latter part of the month; the frost the hardest ever recorded so late in March.

BANBURY.—S on five days; high wind on seven days.

CULFORD.—A stormy and very cold month, with little R; temp. twice fell to 19°.

COSSEY.—The month was cold at the beginning, and very cold at the end; dry weather after the 8th, favourable for agricultural operations.

BODMIN.—Mean temp. of the month, 45°·7.

CIRENCESTER.—Rainfall moderate; some West wind in the early part of the month, then North-west, and afterwards North-east and East, with frosts and fine weather. A good month for cultivating the land.

WOOLSTASTON.—Mean temp. of month, 41°·8.

ORLETON.—The first four days were cold and frosty, with S. R fell all day on the 5th, but not heavily; and on the 6th the Teme was much flooded. The weather then became warmer, and was generally fine and pleasant, with a temp. much above the average, till the evening of the 20th, when the wind set in from N. and E., and continued to blow steadily, and frequently strongly from those points till the end of the month, with a generally clear atmosphere and severe frost every night. Mean temp. nearly 0°·5 above the average.

GRIMSBY.—Month very cold throughout, excepting a very few days; first part wet, latter part dry. Farm work very backward, and much disease among ewes and lambs. Trees very backward.

MANSFIELD.—S on six days; frost at beginning and end of month.

ARNCLIFFE.—S on five days.

NORTH SHIELDS.—S more or less on 13 days.

SEATHWAITE.—Fearful snowstorm on the 4th. On the 8th and 9th, 6·07 in. of R fell, causing a terrible flood on the latter day. Frost and S towards the end of the month.

WALES.

HAVERFORDWEST.—The first two days were extremely cold; on the 3rd a gale of terrific violence occurred, and it is generally believed that the force of the wind exceeded that during the memorable gale and snowstorm of January 18th and 19th. From the 4th to the 15th the weather was generally wet and, at times, stormy; sharp frosts occurred on the 16th, and from about the 20th to the end of the month, with cutting Easterly winds, the sky being generally clear and often cloudless. A fine double solar halo was seen on the 8th, and at night the wind blew half a gale, increasing in force the next day. Mean temp. of month, 42°·3; mean temp. of last 11 days, 37°·4. Wind blew from E. or S.E. on 10 days, and from W. or N.W. on 10 days.

LLANDUDNO.—Both ends of the month were cold and inclement, but from the 5th to the 21st there was some fine mild weather, and the mean temp. of the whole month was about 2°·0 above the average. There were 85 hours of bright sunshine during the month, and the rainfall was about the average. Polar winds prevailed on 16 days, and tropical on 15. Frost occurred on 10 nights.

SCOTLAND.

CARGEN.—From 21st to end of month very cold weather; vegetation greatly checked, and everything very late. Mean temp., 39°·4, 1°·9 below the average. S on five days.

HAWICK.—Such a severe March was never seen before by anyone living in Hawick, more S than dust, and lambs suffered much; vegetation and farm work extremely backward. There were only seven days, from 11th to 18th, that were at all spring-like.

KILMORY.—S on nine days, and frequent sharp frosts.

QUINISH.—From 1st to 8th, bitterly cold and very stormy: from 9th to 19th, fine and very mild; from 19th to end of month, very cold and stormy.

ARBROATH.—On the 4th and 5th occurred the greatest snowfall since January and February, 1823.

BRAEMAR.—Agricultural and horticultural labour entirely prevented by frost.

ABERDEEN.—Weather cold, unsettled and stormy; heavy snowfall on the 5th, accompanied by strong S.E. gales, causing drifts which blocked the railways North and South for several days; the telegraph wires too were broken by the gale. Gales and showers of R, H, and sleet were frequent, retarding agricultural operations very much. Faint Aurora was seen on three nights.

PORTREE.—A cold stormy month, with more S and frost than usual; heavy Westerly gale on 23rd and 24th. Sheep in bad condition on hill pastures.

CULLODEN.—The month was cold and very ungenial, with heavy falls of S during the early part. Work in garden and field much retarded.

SANDWICK.—The month was unprecedentedly cold and stormy; mean temp., 35°·8, lower than that of any other March during the last 55 years. The anemograph recorded 19,702 miles of wind, which is 5,393 miles more than the average, and more than in any March during the past 21 years, though one of the cups was broken off by a storm on the 6th and was wanting the greater part of the month. There were six gales of 50 miles an hour or more, amounting on two occasions to 62 and 63 miles respectively. S covered the ground on 15 days, with occasional drift; Aurora was seen on 2nd.

IRELAND.

CORK.—Very wet on 2nd and 3rd; 2·91 in. of R fell, flooding many streets in Cork.

WATERFORD.—March winds and frost at night; very cold from 24th to end. Heavy gale on 3rd and 4th. Very little growth of vegetation.

KILLALOE.—Continuous rains and heavy gales in the early part of the month, dull and wet from 18th to 25th, remainder of month splendid seasonable weather; some very sharp frosts and cold N.E. winds in the last fortnight.

MONKSTOWN.—The month was very variable; the early part rainy, heavy S and H on 21st, the end very cold, with winds from N.W. to N.E., and occasionally hard frost; very dry and parching.

WARINGSTOWN.—Spring very backward.

ASSOCIAZIONE METEOROLOGICA ITALIANA.

WE have been requested to announce that the Italian Meteorological Alpin Apennine Correspondence (Established about 1866) and the Italian Meteorological Society, formerly presided over by Prof. Ragona, have been fused, and that a new body has been formed under the title of the Italian Meteorological Association, which has H.M. the King of Italy for its Honorary President, and Padre Denza for Acting President. The offices of the Association are at 13, Via Lagrange, Turin, but the Central Observatory, to which scientific correspondence should be sent, is that at Moncalieri, which is about five miles south of Turin.